



FROM DECLARATION TO REAL PROTECTION

**BIODIVERSITY AND LOCAL PARTICIPATION
IN THE MANAGEMENT OF FOUR
PROTECTED AREAS IN NICARAGUA**

Helle Munk Ravnborg

*With the collaboration of Álvaro Noguera Talavera, Eileen Mairena
Cunningham, Francisco Paíz Salgado, Francisco Reyes, Nelson Toval
Herrera and Ricardo Rueda*

DIIS REPORT 2010:04

October 2009

© Copenhagen 2010

Danish Institute for International Studies, DIIS

Strandgade 56, DK-1401 Copenhagen, Denmark

Ph: +45 32 69 87 87

Fax: +45 32 69 87 00

E-mail: diis@diis.dk

Web: www.diis.dk

Cover Design: Carsten Schiøler

Layout: Allan Lind Jørgensen

Printed in Denmark by Vesterkopi AS

ISBN 978-87-7605-373-4

Price: DKK 50.00 (VAT included)

DIIS publications can be downloaded

free of charge from www.diis.dk

Hardcopies can be ordered at www.diis.dk

Contents

Summary	4
1. Introduction	5
2. The four protected areas	9
3. Biodiversity of the protected areas	15
4. Human use of the wild flora in different parts of the four protected areas	22
5. The participation of local actors in the management of the protected areas	30
6. Conclusions	39
Annex 1	44
References	46

Summary

This report presents the results of comparative research regarding local participation, floristic biodiversity and local knowledge of plants conducted in four protected areas in Nicaragua. The research has been financed as part of a Danish support programme for the environmental sector in Nicaragua, under the auspices of the programme management committee chaired by the Minister for Environment and Natural Resources.

The objectives of protection often go beyond the protection of forests to also include the protection of biodiversity, ecosystem integrity and landscape qualities. However, the common instruments used for environmental protection such as control posts, forest guards, patrols and checkpoints, which can be useful for forest management, are inappropriate for dealing with such dimensions, as these are more dependent on spatial interactions. This significantly limits the real protection that can be provided. Rather than conservation instruments and specific institutional arrangements in themselves, the report concludes that real protection depends on an explicit focus on how to 'manage' the *actors* associated with a protected area, i.e. how to provide incentives and disincentives to govern their activities related to the protected area, rather than a focus placed on how to manage the protected *area*.

I. Introduction

The commonly held image of a protected area is that of a dense, pristine forest, with a rich and varied fauna and flora, where the objective of protection is to safeguard nature from (possible) intervention by human beings. However, the reality is that protected areas are far from this image. At a global level, twelve percent of the world's land surface has been declared 'protected area' (United Nations list of protected areas – 2003), while in Nicaragua this figure rises to 22 percent (WRI, 2003). As observed by Haller and Galvin (2008), 'protected areas' in fact represent the world's biggest land-use category. The objectives of protection also tend to vary considerably from what is commonly perceived. People are found living in most protected areas, worldwide as well as in Nicaragua, and often the objective of protection is to safeguard ecosystems and landscapes that over the course of time have been moulded through specific interactions between nature and humans. Such areas offer important aesthetic, ecological and cultural values, and are often home to a rich biodiversity (IUCN and UNEP, 2006).

Therefore, protected areas can vary in accordance to many factors, including the following:

- the qualities that are to be protected and the ecological processes responsible to maintain them (the objectives of conservation); and
- the actions to be detained through protection, that is, the activities and/or forces of change that endanger the qualities to be protected.

This implies that the type of protection, or type of governance and management of the protected area that would be necessary to detain the activities and changes that endanger that which the aim is to protect, depends on the combination of these two factors, consequently varying between one protected area and another.

1.1 About IBESo¹

In 2006, the group of Nicaraguan and Danish research institutions that had already worked together on IBESo I in the Indio Maíz Biological Reserve and its buffer zone,

¹ IBESo is the Spanish acronym for Investigación sobre Biodiversidad, Ecología y Sociedad (Research on Biodiversity, Ecology and Society).

El Castillo², received an invitation to widen their work focus so as to include other protected areas. Responding to this invitation, a proposal for IBESo II was drafted: *From declaration to real protection – a comparative research programme on the management of protected areas in Nicaragua*.³

The proposal was approved by the Nicaraguan Minister for Environment and Natural Resources in her role as president of the programme management committee for the support of the environmental sector (PASMA II), financed by the Danish International Development Agency (DANIDA) of the Danish Ministry of Foreign Affairs.

The general objective of IBESo II was to contribute towards improving the institutional set-up for the governance and management of protected areas, along with technical instruments such as zoning and management norms to facilitate the participation of local actors in the management of protected areas. IBESo II covers the following three specific themes:

- the presence and distribution of plant species within the protected area and corresponding buffer zone;
- the use of the flora found in the different parts of the protected area and its buffer zone; and
- the relationship between the participation of local actors and the environmental management instigated by the authorities involved in the administration of the protected area;

IBESo II was initiated at the end of April 2007, and between May 2007 and June 2009 research teams formed by researchers from FARENA, UNA (Natural Resources and Environmental Faculty, National Agricultural University); the Herbarium of UNAN-León (National Autonomous University of Nicaragua Botanical Unit); and Nitlapan, UCA (Institute of Applied Research and Local Development, Central American University) undertook a comparative research in four protected areas. These four areas are the Indio Maíz Biological Reserve (RBIM according to its Spanish acronym) and its buffer zone,⁴ specifically the area located in the municipality of El Castillo; the Bosawas Natural Reserve (RNB according to its Spanish acronym)⁵ specifically the indigenous territory of Miskitu Indian Tasbaika Kum

² A synthesis and other products of this work are available at: www.diis.dk/ibeso - see under IBESo I.

³ The proposal is available at www.diis.dk/ibeso - see below IBESo II.

⁴ The RBIM and its buffer zone form part of the Río San Juan Biosphere Reserve.

⁵ The RNB forms part of the Bosawas Biosphere Reserve.

(MITK); the Protected Terrestrial Landscape of Mirafior-Moropotente (MM) that covers parts of the municipalities of Estelí, Condega, Yalí and La Concordia; and the Municipal Ecological Park Canta Gallo (CG) located within the municipalities of Condega and Telpaneca.

In each of these protected areas, it was decided to focus field work in three communities, selected so as to represent, to the widest extent possible, the range in socio-economic⁶ and bio-physical⁷ conditions present in the protected areas. Table I shows the communities selected in each protected area and Annex I provides a more detailed characterisation of these communities. The present report draws on this work and contains a synthesis of some of the results from the research carried out.⁸

Table I. Communities selected for the field work for IBESo II, according to protected area.

	<i>Indio Maíz Biological Reserve (El Castillo)</i>	<i>Bosawas Natural Reserve (Miskitu Indian Tasbaika Kum)</i>	<i>Protected Terrestrial Landscape Mirafior-Moropotente</i>	<i>Municipal Ecological Park Canta Gallo</i>
<i>Selected Community</i>	Filas Verdes Las Maravillas Laureano Mairena	La Esperanza Boca de Plis Yakalpanani	Las Lagunetas El Sontule El Coyalito	San Jerónimo Venecia El Bramadero

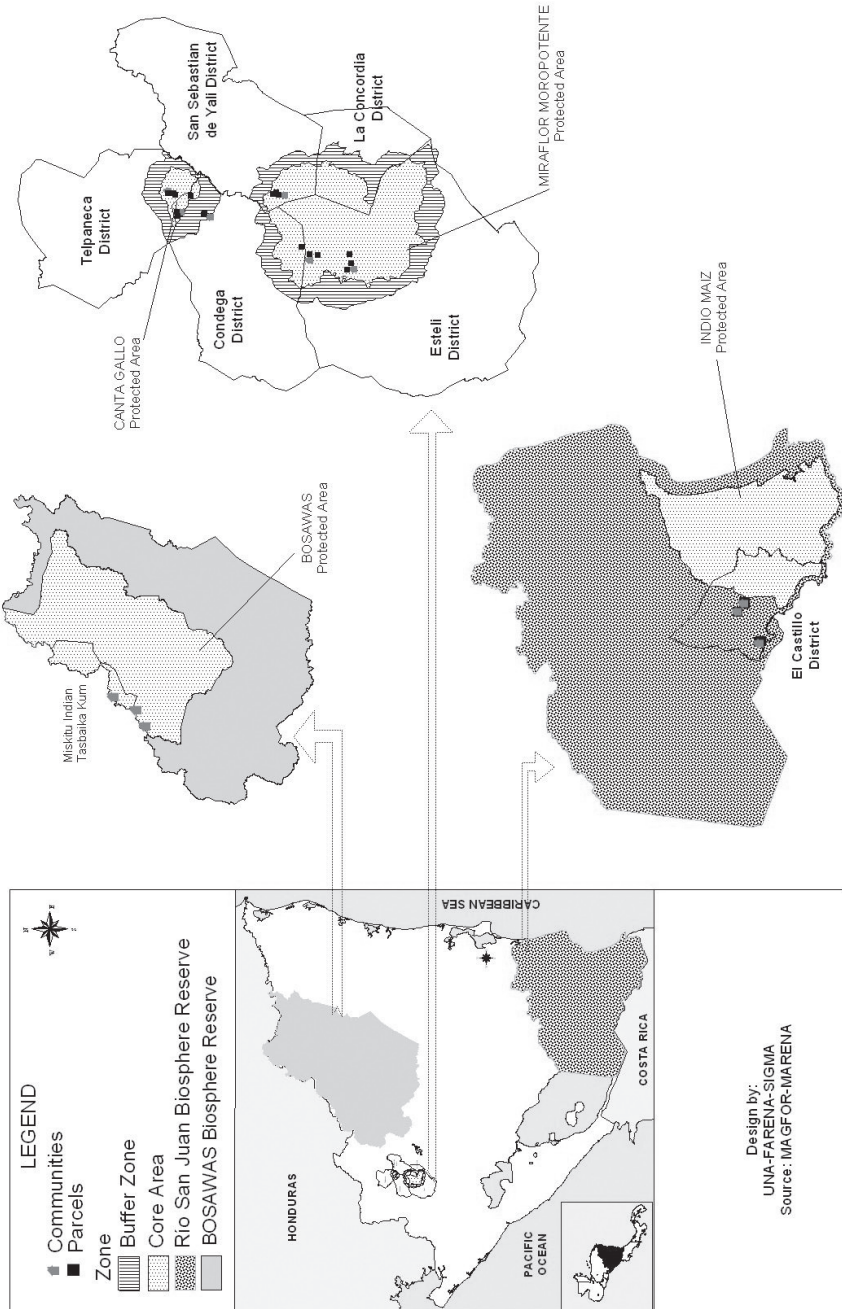
Map 1 shows the four protected areas and the location of the communities selected for the field work.

⁶ The conditions taken into account were predominant ethnicity, accessibility and population density.

⁷ The conditions taken into account included agro-ecological zones and the presence of different habitats/ecosystems.

⁸ More detailed results are published by the institutions responsible (Mairena and Paíz, 2009; Noguera and Reyes, forthcoming; and Toval and Rueda, forthcoming).

Map I. The four protected areas and location of the communities included in the field study



2. The four protected areas

The four protected areas where the comparative research was undertaken for IBESo II differ from each other in various aspects, including their category of protection, the natural features identified for protection, the institutional set-up for their administration, their demographics, the activities and forces of change that endanger that which is sought protected, and the actors associated with these activities and forces of change vis-à-vis the actors and associated motives in favour of the protection.

Both the Bosawas Natural Reserve (RNB) and the Indio Maíz Biological Reserve (RBIM) form part of a Central American belt of broadleaved, humid, tropical forest which since the mid-nineties has been known as the Mesoamerican Biological Corridor. This is a zone rich in biodiversity, both in terms of fauna and flora, and contains significant patches of primary forest. Both reserves form part of biosphere reserves: the Bosawas Biosphere Reserve and Rio San Juan Biosphere Reserve, respectively, which have been certified by the Man and the Biosphere (MAB) programme of UNESCO. According to the Ministry of Environment and Natural Resources (MARENA),⁹ the area covered by RBIM is 3.157 km² (Ravnborg, 2006), while that of RNB is 7.442 km².

In contrast, the Municipal Ecological Park Canta Gallo and the Protected Terrestrial Landscape Miraflores-Moropotente are located in a mountainous zone at altitudes of between 700 and 1,400 metres above sea level. They have a temperate climate and a mix of broadleaved and coniferous forest, with areas of cloud forest at the highest levels. Apart from the remaining patches of primary forest, the landscape in the high- and middle-sectors is characterised by a mosaic of small plots of shaded coffee plantations interspersed with plots of grassland and bean and maize fields. These landscapes are also home to a high level of biodiversity and provide many ecological and aesthetic services. The core area of Miraflores-Moropotente covers 294 km² (MARENA, 2005), while Canta Gallo covers an area of 137 km² (Municipal Environmental Commission or CAM, 2000a).

Canta Gallo and Miraflores-Moropotente formed part of the agricultural frontier zone from the beginning of the 20th Century up until the 1940s (Zeledon and Kelly,

⁹ Ravnborg (2006) and http://www.marena.gob.ni/index.php?option=com_content&task=view&id=212&Itemid=466.

2008), while the Bosawas Natural Reserve and El Castillo have been part of the more recent agricultural frontier. In the southern section of the Bosawas Natural Reserve, the number of migrant families increased over a period of six years from 167 families in 1990 to 1977 in 1996 (Stocks *et al.*, 2007). However, Stocks and his colleagues estimate that the arrival of new families in the Bosawas Natural Reserve practically came to an end in 1998 (*ibid.* 1497). This finding was corroborated by population census data that indicated a population increase in the municipality of Jinotega of only 11 percent between 1998 and 2005.¹⁰ In contrast, there was continued migration to the Indio Maíz Biological Reserve and the municipality of El Castillo, which forms part of the RBIM and part of the buffer zone, where a population increase of over 100 percent was registered between 1998 and 2005.¹¹

Population density is estimated at between 60 and 80 persons per km² in Canta Gallo and Miraflores-Moropotente, while in the Bosawas Natural Reserve and El Castillo, population density is much lower, with around 4 persons per km² in the RNB in 2002 (Stocks *et al.*, 2007) and an average of 12 persons per km² in the municipality of El Castillo (INIDE, 2008).

The RBIM and RNB were created as protected areas by State decrees in 1990¹² and 1991,¹³ respectively, with the aim of preserving their extensive areas of humid, tropical forest with its rich biodiversity. Moreover, for Bosawas, one of the aims of protection has been since its foundation, the protection of indigenous territories from non-indigenous incursion associated with the advance of the agricultural frontier.

Through a process instigated by the Miskitu and Mayangna indigenous groups that began in 1993 with support provided by the international NGO, The Nature Conservancy (TNC), and the Nicaraguan NGO, Centro Humboldt, 86 communities from five¹⁴ of the six indigenous territories, including Miskitu Indian Tasbaika Kum (MITK), received collective property land titles for their territories in May 2005

¹⁰ From 51,985 persons in 1998 to 57,485 in 2005 (National Institute of Development Information-INIDE). The corresponding figure for Nicaragua is 18 percent.

¹¹ From 9,717 persons in 1998 to 19,864 in 2005.

¹² Decree 527 signed on April 17, 1990. (<http://www.ccad.ws/documentos/legislacion/NC/D-527.pdf>, consulted May 4, 2009).

¹³ Decree 44-91 signed on October 31, 1991 (<http://www.fundenic.org.ni/Biblioteca/areasprotegidas/Dec44-91.pdf>, consulted May 4, 2009).

¹⁴ One of the indigenous territories, Mayangna Sauni Bas, received its land title deed before the revolution (Howard, 2006:219).

(Stocks *et al.*, 2007).¹⁵ After a period of uncertainty, the deeds were formally registered in the Public Registry of Property in December 2007.¹⁶

The Protected Terrestrial Landscape Miraflores-Moropotente was created joining together two protected areas: (i) Las Mesas de Moropotente, declared a protected area in 1991, when various hills and mountains were declared protected areas as part of an effort to preserve the biodiversity, endemism and water sources present in these high-altitude zones,¹⁷ and (ii) Miraflores, which was declared a natural reserve by the General Law of the Environment and Natural Resources of 1996¹⁸ in response to efforts in favour of the declaration carried out by local farmers through their second-order cooperative, the UCA Miraflores (MARENA, 2005; Ravnborg, 2002 and 2008). The first step to unite the two protected areas was taken in 1999 when they were declared the Miraflores-Moropotente Demonstration Area.¹⁹ Following this in 2004, with the approval of the management plan drafted between 1999 and 2004, the two protected areas became one single protected landscape.²⁰

One of the most important reasons for proposing the protected landscape management category was to promote the recognition that, along with deforestation, one of the biggest threats for the conservation of the biodiversity present in the area²¹ is the process of landscape fragmentation, principally in its forest areas (MARENA-PANIF, 2001; MARENA, 2005). This process of landscape fragmentation is caused by an increase in the population as well as by the conversion of some areas for permanent agricultural use, especially grazing land.²² The management plan also refers to the threat to biodiversity represented by the pollution of water resources caused by chemical residues.

¹⁵ The communities located in the Mayangna Sauni Bas (Sikilta) territory in Siuna received their land title deed in April 2009.

¹⁶ <http://www.elpueblopresidente.com/LEYES-y-PROPIEDAD/277.html>, consulted May 3, 2009.

¹⁷ Decree 42-91 signed October 31, 1991. ([http://legislacion.asamblea.gob.ni/Normaweb.nsf/\(\\$All\)/8F7597505B329EB0062570A10057D908?OpenDocument](http://legislacion.asamblea.gob.ni/Normaweb.nsf/($All)/8F7597505B329EB0062570A10057D908?OpenDocument); consulted on May 4, 2009).

¹⁸ Law 217 of May 2, 1996, article 154 (<http://www.eia-centroamerica.org/archivos-de-usuario/File/Ley%20General%20del%20Medio%20Ambiente%20y%20los%20Recursos%20Naturales%202017.pdf>; consulted May 4, 2009).

¹⁹ Ministerial resolution 017-99 of September 7, 1999 ([http://legislacion.asamblea.gob.ni/Normaweb.nsf/\(\\$All\)/3DDB5A1CE03D594A062570A10058010C?OpenDocument](http://legislacion.asamblea.gob.ni/Normaweb.nsf/($All)/3DDB5A1CE03D594A062570A10058010C?OpenDocument); consulted May 4, 2009).

²⁰ Ministerial resolution 039-2004 of August 23, 2004 ([http://legislacion.asamblea.gob.ni/Normaweb.nsf/\(\\$All\)/AF0D388FAEBF9EA5062570A10058378C?OpenDocument](http://legislacion.asamblea.gob.ni/Normaweb.nsf/($All)/AF0D388FAEBF9EA5062570A10058378C?OpenDocument), consulted on May 4, 2009).

²¹ A study carried out by Ana Paola Correa Do Camo in the mountain forests of Miraflores-Moropotente in 2000 recorded 288 species, 78 (27%) of which were considered endemic to Nicaragua (MARENA, 2005).

²² According to data gathered by MARENA for 1999, around 66% of the agricultural area of Miraflores-Moropotente is used for pastures, while 34% is used for annual crops (MARENA, 2005: table 24).

Like Miraflores, the initiative for the protection of Canta Gallo arose at local level. First of all, the Condega district government was concerned about the frequent occurrence of forest fires, the ongoing deforestation (Canta Gallo contains an extensive area of pine forest – 630 hectares – known as ‘the Alps’), and the shortage of water, the source of which for many communities to the east of the Pan-American Highway lies in the highland sectors of Canta Gallo. The district government requested MARENA to undertake a more effective regulation of the use of the area’s natural resources. However, in spite of an affirmative response to the request, the Ministry’s efforts were insufficient to control the situation.

Secondly, the organic coffee cooperatives located in the communities Venecia and San Jerónimo, together with a group of NGOs, took the initiative to propose that Canta Gallo be declared a protected area. During a period, the members of the cooperative had seen how in the neighbouring mountains of Miraflores, “UCA Miraflores had been able to involve both MARENA-PANIF as well as other international organisations” and how in that area “there were cars heading in all directions,”²³ all thanks to their efforts to promote a declaration of protection. By proposing that Canta Gallo be declared a protected area, they hoped that this would encourage aid agencies to provide them with the support needed for the development of organic coffee production along with other sectors, including eco-tourism.²⁴ The idea was proposed to the Municipal Environmental Commission (CAM) of Condega, and together they drafted a proposal (CAM, 2000a, and 2000b). Consequently, a consultation process began with the communities located within the protected area. In 2001, this process resulted in Canta Gallo being declared the Municipal Ecological Park of Condega.²⁵ The district office has requested that Canta Gallo be recognised as part of the National System of Protected Areas (SINAP according to its Spanish acronym) established by MARENA, although to date this has not taken place.²⁶

All four protected areas are subject to the pressure exerted by the growing population in or around these areas, which is one of the threats that endangers their protection,

²³ Interview with a group of community leaders, San Jerónimo, March 2003.

²⁴ Direct communication with Manuel Castillo Zavela and Jose Eddy Catillo, San Jerónimo, March 2001; and interview with a group of community leaders, San Jerónimo, March 2003.

²⁵ Municipal by-law 007-02, Municipal Council of Condega, November 30, 2001, recognises that part of the proposed buffer zone corresponds to the municipality of Telpaneca; the communities of Los Planes and San Jerónimo were not incorporated within this municipal by-law.

²⁶ One of the obstacles for including the protected area in SINAP has been the fact that, as regards the initial proposal, part of the park is located in the neighbouring municipality of Telpaneca, which to date has not approved the declaration to establish the park.

mainly due to deforestation when an area of forest is cleared for either a settlement or crops. In Miraflores-Moropotente and Canta Gallo, such pressure is mainly caused by the local population living in the protected area, while in the RNB and RBIM, the population threat is related to the continuous arrival of families from other parts of the country searching for (cheap) land.

Although less explicit, there is also a perceived threat represented by external actors involved in timber extraction. In the RBIM and RNB this involves the extraction of valuable timber, while in Canta Gallo it concerns pine wood and in Miraflores-Moropotente the extraction of firewood that is sold outside of the area. Finally, as previously mentioned, the management plan for Miraflores-Moropotente recognises the threat related to landscape fragmentation due to the permanent conversion of forest tracts into grazing land and other monocultures, particularly when the crops concerned require large amounts of agrochemicals.

Along with these threats recognised during the preparation for the declaration, two other types of threats have recently emerged, both related to external actors outside of Nicaragua. One is the pressure exerted by Honduran cattle owners in the frontier zone of Bosawas, who have been crossing the Coco River in search of grazing access for their herds on Nicaraguan territory.²⁷ As these are temporary arrangements that do not raise the issue of land ownership, they may compromise the achievement of conservation objectives, both in those areas with a mestizo population as well as the indigenous territories of the RNB and its buffer zone.

The second threat which has not been directly mentioned in the management plans for RBIM and its buffer zone is the significant increase in African oil palm plantations, catering to the international demand for vegetable oils. As indicated both by government institutions and by civil society representatives (Centeno, 2006; Ros-thchuh, 2006 and 2007), such plantations lead to deforestation and an important loss of biodiversity, along with other serious environmental problems such as organic and chemical pollution, compression and loss of topsoil, and the displacement of the local population.

With such impacts, these extensive plantations act against the general objective associated with the demarcation of buffer zones which, according to the regulation for

²⁷ According to information provided by the army for the control post located at Bolinki in April 2007, Hondurans paid USD 4 per head of cattle per month for grazing access.

protected areas in Nicaragua,²⁸ is the promotion of sustainable development activities in support of management objectives and minimisation of negative impacts within the protected areas of the SINAP. In 2006, a legal process was begun against the company PALCASA for the felling of 500 hectares of forest in the buffer zone to RBIM. However, this led only to a warning and an order to reforest 65 hectares. The company not only refused to obey the order, but appealed against the ruling before the Office of the Public Prosecutor and won the case.²⁹

²⁸ Decree 01-2007 approved January 8, 2007.

²⁹ Rosthchuh noted (2006) that the head of PALCASA is the former vice-minister of MARENA, Jorge Salazar Cardenal.

3. Biodiversity of the protected areas

3.1 Characterisation of floristic biodiversity in the four protected areas

As part of the work of IBESo II, a floristic inventory was carried out on 39 parcels³⁰ set up in the three selected communities in each of the four protected areas, the aim being to contribute towards a characterisation of the biodiversity of the areas.³¹ The parcels³² were situated in such a way as to represent the range of variation within the local environment, primarily with respect to the composition of vegetation. Three categories of ecosystem were considered, guiding the location of the parcels: un-intervened natural ecosystems;³³ intervened natural ecosystems³⁴ and productive ecosystems.³⁵ Table 2 shows the number of parcels established per ecosystem in the four protected areas (see also Map 1 which shows the location of the parcels).

Table 2. Parcels established for the floristic inventory per ecosystem in the four protected areas. *Number of parcels*

	Indio Maíz Biological Reserve (El Castillo)	Bosawas Natural Reserve (Miskitu Indian Tasbaika Kum)	Protected Terrestrial Landscape Miraflor- Moropotente	Municipal Ecological Park Canta Gallo	Total
Un-intervened natural ecosystems	3	3	5	6	17
Intervened natural ecosystems	6	6	2	4	18
Productive ecosystems	0	0	2	2	4

³⁰ Annex I contains more information regarding the location and characteristics of the parcels.

³¹ This work was coordinated by Álvaro Noguera Talavera of FARENA, UNA with support from Nelson Toval Herrera, Herbario de UNAN-León.

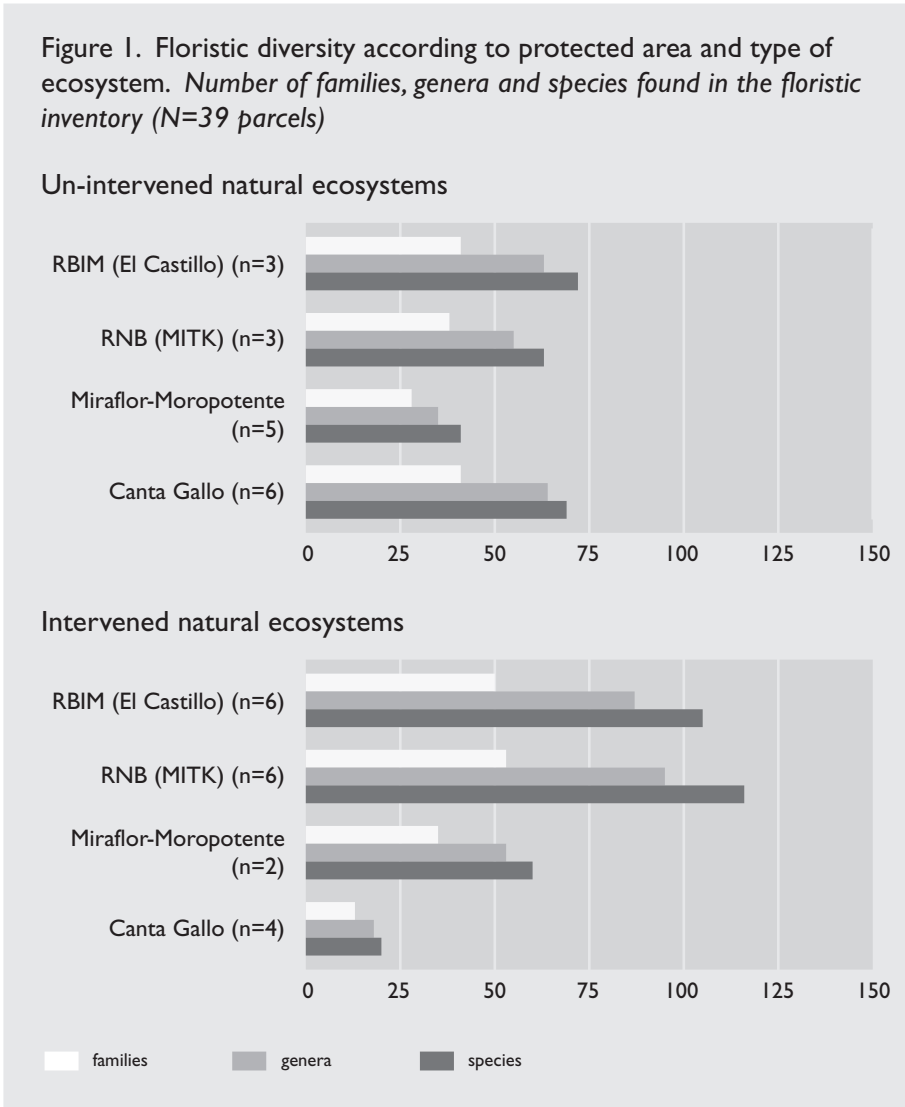
³² The 20 x 50 metres parcels were demarcated with biodegradable tape and aluminium plates.

³³ Forest cover more than 30 years old. In addition to un-intervened broadleaved forest, in Miraflor-Moropotente and Canta Gallo parcels of this ecosystem type include unexploited pine forest.

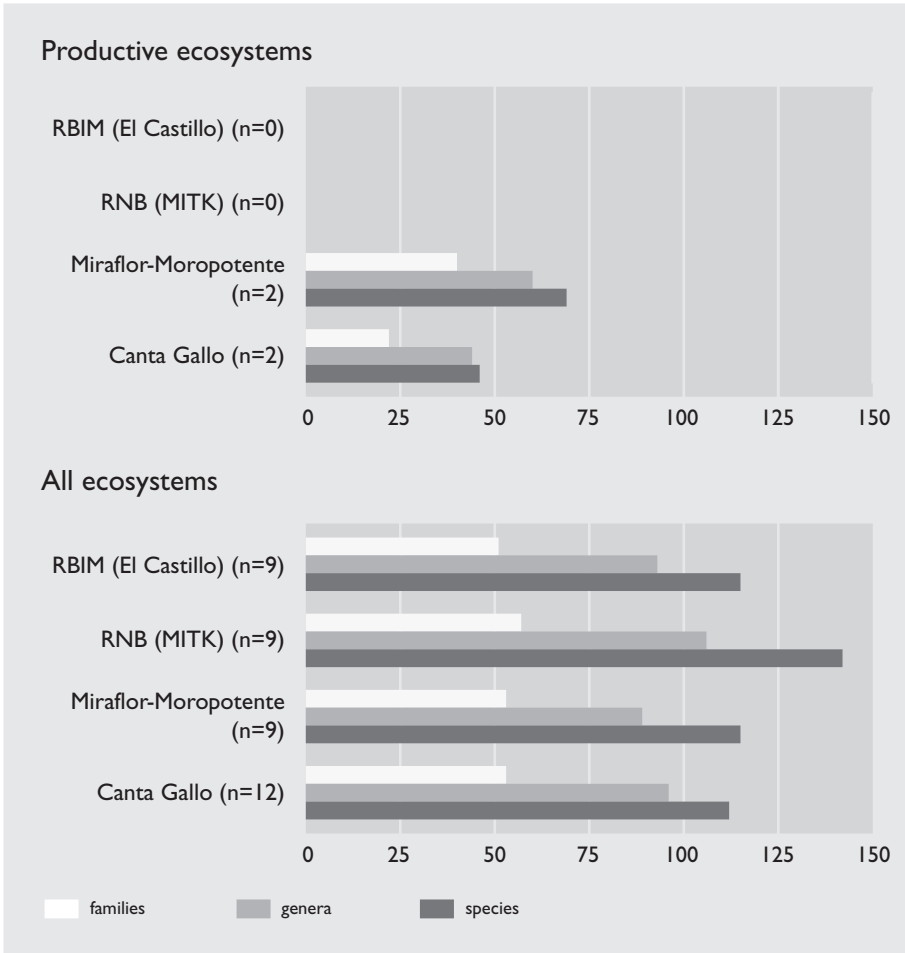
³⁴ Forest cover less than 30 years old.

³⁵ In our case, systems of shaded coffee plantations.

In each parcel, a complete inventory of plants with a stem diameter of minimum 2.5 centimetres was carried out. In total, 7,239³⁶ plants were recorded during the work. Figure 1 shows the number of plant families, genus and species represented by these 7,239 individual plants, according to type of ecosystem and protected area.



³⁶ Each parcel was divided into 10 sub-parcels of 10 x 10 metres. An inventory was made in these sub-parcels of all the tree and shrub flora with a stem diameter greater than 2.5 centimetres. Also, and with modifications to the Gentry method, six transects of 2 x 20 metres were created.



The RNB and RBIM and their buffer zones were found to have the most abundant level of species in the intervened natural ecosystems, while Miraflores-Moropotente had the most abundant floristic diversity within the shaded coffee systems. Only Canta Gallo was found to have the most abundant floristic diversity within the un-intervened natural ecosystems, followed by the shaded coffee systems. It is interesting to note that most of the species found in the shaded coffee parcels are native species (between 75 and 85 percent), thus representing an important factor for the conservation of floristic biodiversity (Perfecto *et al.*, 1996). Additionally, as these serve as corridors that provide linkages between fragments of forest, they are home to an extensive fauna (Harvey and Saenz, 2008).

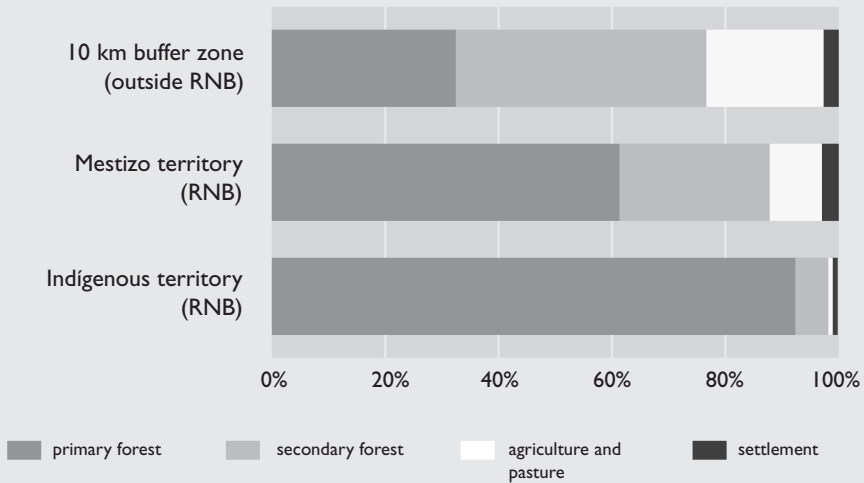
Based on an analysis of floristic similarity³⁷ between the ecosystems in each protected area, it was observed that there is a great similarity between the natural and intervened ecosystems in RBIM and its buffer zone in El Castillo and in Bosawas. This is due to the agricultural production techniques employed, involving a minimum impact in terms of biodiversity, and so providing the conditions for the natural regeneration of vegetation, especially when controlled cutting of the plant biomass (known as 'la chapia' in Spanish) rather than burning is used during land preparation. In Miraflores-Moropotente and in Canta Gallo, the same phenomenon was observed regarding naturally shaded coffee systems, although permanent plantations of monoculture crops such as pastures, African palm and to a lesser degree annual crops, have a negative impact in terms of biodiversity (Vandemeer and Perfecto, 2007; Harvey *et al.*, 2008).

These results are consistent with those obtained by Stocks and his colleagues in the Bosawas Natural Reserve. Through analysis of changes in vegetation cover in different parts of the RNB between 1987 and 2002, using geostatistical procedures and Landsat images combined with demographic and socio-economic studies undertaken during the 1990s. Stocks and his colleagues found that deforestation per hectare was 0.24 hectares per person between 1987 and 1995/1996 and 0.15 hectares per person between 1995/1996 and 2002 in the indigenous territories. However, in the non-indigenous section of the RNB, the deforested area per person was 1.65 hectares for the first period and 2.50 hectares in the latter period, indicating an average for deforestation 16 times greater than for that of the indigenous territories (Stocks *et al.*, 2007:1500). Based on these results, along with the analysis of the normalised burn ratio (NBR), they concluded that indigenous agricultural practices have a lower impact on the forest than those of mestizo colonists. In total, based on the analysis of vegetation cover for 2001/2002, they estimated that in the five indigenous territories³⁸ of the RNB, primary forest made up 92 percent of the area while the agricultural section, including grassland, barely represented 1 percent. In the mestizo section of the RNB, primary forest represented 61 percent of the area, while the agricultural section made up 9 percent. In the 10 km of the buffer zone outside of the RNB, only 32 percent of the area is primary forest while the agricultural and grassland area came to 20 percent (see Figure 2).

³⁷ Basada en el índice de Jaccard (Moreno, 2001).

³⁸ Normalized Burn Ratio (NBR).

Figure 2. Vegetation cover in the Bosawas Natural Reserve by territory
Primary forest, secondary forest, agriculture and pasture, settlements in indigenous and mestizo territories and in the buffer zone, percent area



Source: Stocks et al. (2007, Table 4).

3.2 Floristic inventory carried out using para-taxonomists in the four protected areas³⁹

Together with the floristic collection carried out as part of the inventory in the parcels, 53 people from the four protected areas were trained as para-taxonomists⁴⁰ in order to have the necessary skills to collect and prepare botanical samples for scientific purposes.⁴¹ Following the training, the para-taxonomists were provided with the materials needed to prepare the samples.⁴² In each protected area, three rounds of purchases of samples were carried out during the period September 2007 to June 2009 with 12,358 samples purchased in total.

³⁹ This section is based on the work coordinated by Nelson Toval Herrera from the UNAN-Leon Herbario (Toval and Rueda, in preparation).

⁴⁰ Twelve people from El Castillo, 15 from RNB, 15 from Miraflores-Moropotente and 11 from Santa Gallo. Two of the people trained from Bosawas and four from Miraflores-Moropotente subsequently did not sell samples.

⁴¹ Training was undertaken by Nelson Toval, who was also in charge of supervising the para-taxonomists.

⁴² In contrast to the work carried out for IBESo I, this time the samples were prepared with alcohol.

Table 3. Purchased and identified botanical sample

	Indio Maíz Biological Reserve (El Castillo)	Bosawas Natural Reserve (Miskitu Indian Tasbaika Kum)	Protected Terrestrial Landscape of Miraflores-Moropotente	Municipal Ecological Park Canta Gallo	Total
Number of purchase trips undertaken	3	3	3	3	12
Number of samples purchased	4,392	3,650	1,625	2,691	12,358
– identified at species level	4,004	3,244	1,444	2,290	10,982
– identified at genus level	368	347	174	391	1,280
– identified at families level	17	58	6	9	90
– unidentified	3	1	0	2	6

The purchased samples represent a total of 171 families, corresponding to 67 percent of the 255 families so far registered for the flora of Nicaragua. These 171 families are grouped in 797 genera and 1,758 species (Table 4).⁴³

Table 4. Description of the identified samples according to families, number of genera and number of species per protected area

	Indio Maíz Biological Reserve (El Castillo)	Bosawas Natural Reserve (Miskitu Indian Tasbaika Kum)	Protected Terrestrial Landscape of Miraflores-Moropotente	Municipal Ecological Park Canta Gallo	Total
Number of families	124	112	116	140	171
Number of genera	470	397	363	524	797
Number of species	785	617	519	779	1,758

⁴³ The full list of species found in the samples purchased from para-taxonomists will be published on the www.diis.dk/ibeso website.

Among the species identified up to species level, five⁴⁴ new species have been recorded for Nicaragua (Table 5).⁴⁵ These are the following:

Table 5. New registrations of Nicaraguan flora collected by the para-taxonomists as part of IBESo II

<i>Family</i>	<i>Genus</i>	<i>Species</i>	<i>Habitat</i>	<i>Author</i>	<i>Collector</i>	<i>Location</i>
Rubiaceae	Alseis	Costaricensis	Tree	C.M Taylor	A. Urbina	Indio Maíz Biological Reserve (El Castillo)
Amaranthaceae	Celosia	Spicata	Herb	(Thouars) Spreng.	Carmen Olivas	Municipal Ecological Park Canta Gallo (Condega)
Asclepiadaceae	Marsdenia	Schlechteriana	Liana	W. Roth	Ely Martínez	Bosawas Natural Reserve (MITK)
Rubiaceae	Randia	Lasiantha	Shrub	(Standl.) Standl.	M. Arguello	Indio Maíz Biological Reserve (El Castillo)
Solanaceae	Solanum	Accrescens	Shrub	Standl & Morton	Carlos Cardenas	Municipal Ecological Park Canta Gallo (Madriz)

⁴⁴ This number may increase as the samples currently only identified according to family or genera are identified according to species level.

⁴⁵ Twenty-three new species have also been reported for the Herbario de Unan-León.

4. Human use of the wild flora in different parts of the four protected areas⁴⁶

Along with the knowledge gained, dependence on natural resources (in this case the flora) is a factor that significantly contributes towards raising the concern about its protection. Therefore, a comparative ethnobotanical study was carried out in the four protected areas as part of IBESo II, so as to determine the level of knowledge and use of plants in the different parts of the four protected areas and their buffer zones, and how such knowledge is distributed among the local population.

Interviews were carried out with small groups (of three people) in the parcels already established for floristic characterisation. Each group was invited to visit the parcels established in their community and the members of the group were asked to mention the plants they knew by their common name⁴⁷ and also to list the local uses of each species they had knowledge of. On average, the group interviews lasted around half-an-hour per parcel and on average each group visited and was interviewed in 3.4 parcels. With a total of 101 groups, a total of 342 group interviews were conducted. Table 6 provides a summary of the groups and their characteristics.

⁴⁶ This section is based on work coordinated by Álvaro Noguera Talavera de la Farena, UNA (Noguera and Reyes, in preparation).

⁴⁷ If the scientific name could not be confirmed *in situ*, a sample of the plant was taken for its subsequent identification, with botanical assistance provided by Nelson Toval Herrera.

Table 6. Characteristics of the established groups for the study of the knowledge and use of plants per protected area

		Indio Maíz Biological Reserve (El Castillo)	Bosawas (Miskitu Indian Tasbaika Kum)	Protected Terrestrial Landscape of Miraflores-Moropotente	Municipal Ecological Park Canta Gallo	All of the four protected areas
Established groups		20	27	31	23	101
Average size of group		3	3	3	3	3
Average number of types of ecosystems visited per group		1.6	2.0	2.7	3.0	2.4
Average number of parcels visited per group		2.5	3.3	3.0	4.7	3.4
Gender	Male groups	9	5	12	6	32
	Female groups	4	8	5	4	21
	Mixed groups	7	14	14	13	48
Ethnicity	Miskitu groups	0	26	0	0	26
	Mestizo groups	20	1	31	23	75
Age	Groups of young people (< 30 years)	8	6	7	6	27
	Groups of adults (30-49 years)	8	6	10	4	28
	Groups of elders (>= 50 years)	3	6	6	3	18
	Mixed groups (all ages)	1	9	8	10	28
Origin	Groups of people born in the community	1	26	20	10	57
	Groups of people born in the region	4	0	9	9	22
	Groups of people born in another region	15	1	2	4	22
Education	Groups of people with no formal schooling	3	11	3	1	18
	Groups of people with primary education	13	16	22	16	67
	Groups of people with secondary education	3	0	6	6	15
	Groups of people with university education	1	0	0	0	1

As shown in Table 7, the groups mentioned an average of 28.7 plants, varying between 19.3 plants identified by the groups interviewed in the RBIM to 34.9 plants identified by the groups interviewed in Miraflores-Moropotente. Viewed on the basis of ecosystem type, the average varies between 11.4 plants recognised by the groups interviewed in the un-intervened natural ecosystems within the RNB, up to an average of 21.0 plants recognised in the parcels located within the intervened natural ecosystems in the RNB.

Table 7. Average number of plants recognised by the interviewed groups per type of ecosystem in the four protected areas (Number of groups in brackets)

Average number of plants recognised in:	Indio Maíz Biological Reserve (El Castillo) (n=20)	Bosawas (Miskitu Indian Tasbaika Kum) (n=27)	Protected Terrestrial Landscape Miraflores-Moropotente (n=31)	Municipal Ecological Park Canta Gallo (n=23)	All the four protected areas (N=101)
Un-intervened natural ecosystems	12.1 (n=11)	11.4 (n=27)	14.4 (n=31)	14.7 (n=23)	13.3 (n=92)
Intervened natural ecosystems	15.4 (n=20)	21.0 (n=27)	15.2 (n=31)	14.6 (n=23)	16.7 (n=101)
Productive ecosystems	-	-	15.5 (n=21)	14.3 (n=23)	14.9 (n=44)
All ecosystems	19.3	26.8	34.9	30.6	28.7

These results, combined with the finding that, except in the case of Canta Gallo, also the highest level of plant diversity was found in intervened ecosystems (figure 1), indicate that human use of natural ecosystems does not necessarily lead to major changes or a reduction in biodiversity. Rather, as long as the natural features of the ecosystem are conserved,⁴⁸ human use may actually enhance biodiversity.

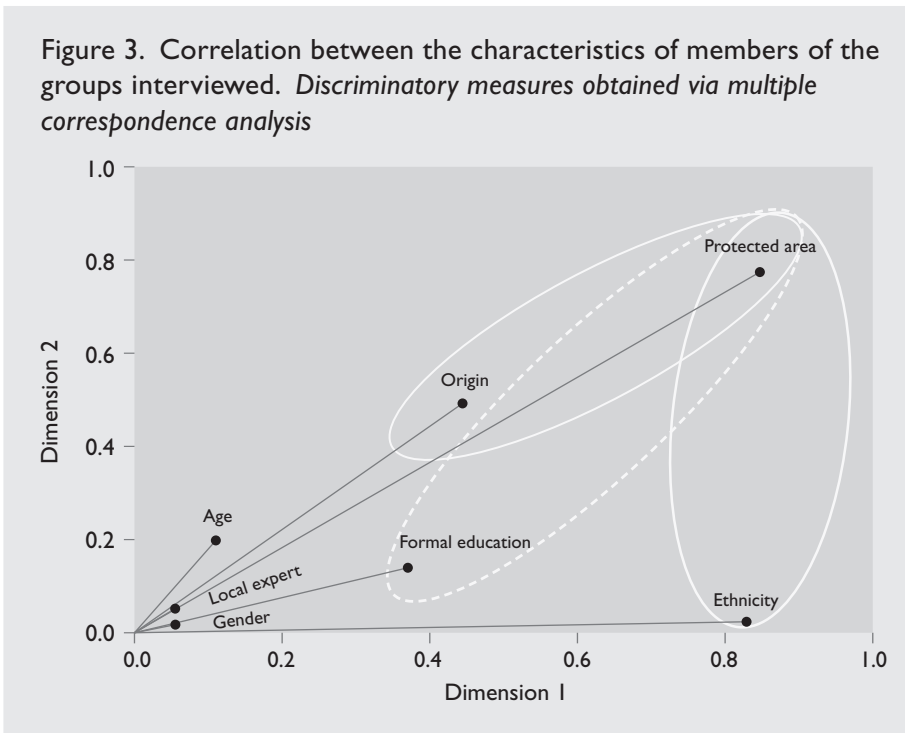
In addition to the analysis of the number of plants recognised by the interviewed groups, an analysis was made of the number of uses mentioned related to these plants in order to assess the extent to which this knowledge and its level of use is

⁴⁸ It is important to note that all the parcels had forest cover.

related to the demographic and socio-economic characteristics of the groups. The characteristics examined are:

- location (protected area)
- ethnicity
- origin
- formal education
- gender
- age
- local experts (midwives, traditional doctors, forest guards, etc.)

Of these, ethnicity,⁴⁹ origin⁵⁰ and, to a lesser degree, formal education⁵¹ are associated with the protected area, as shown in figure 3.



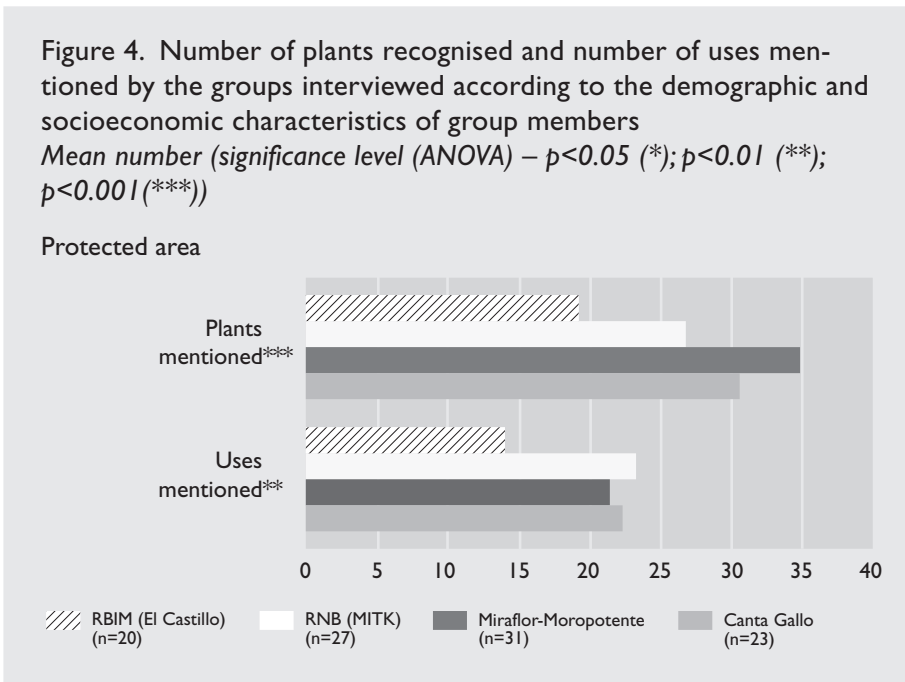
⁴⁹ There is an indigenous population only in the RNB.

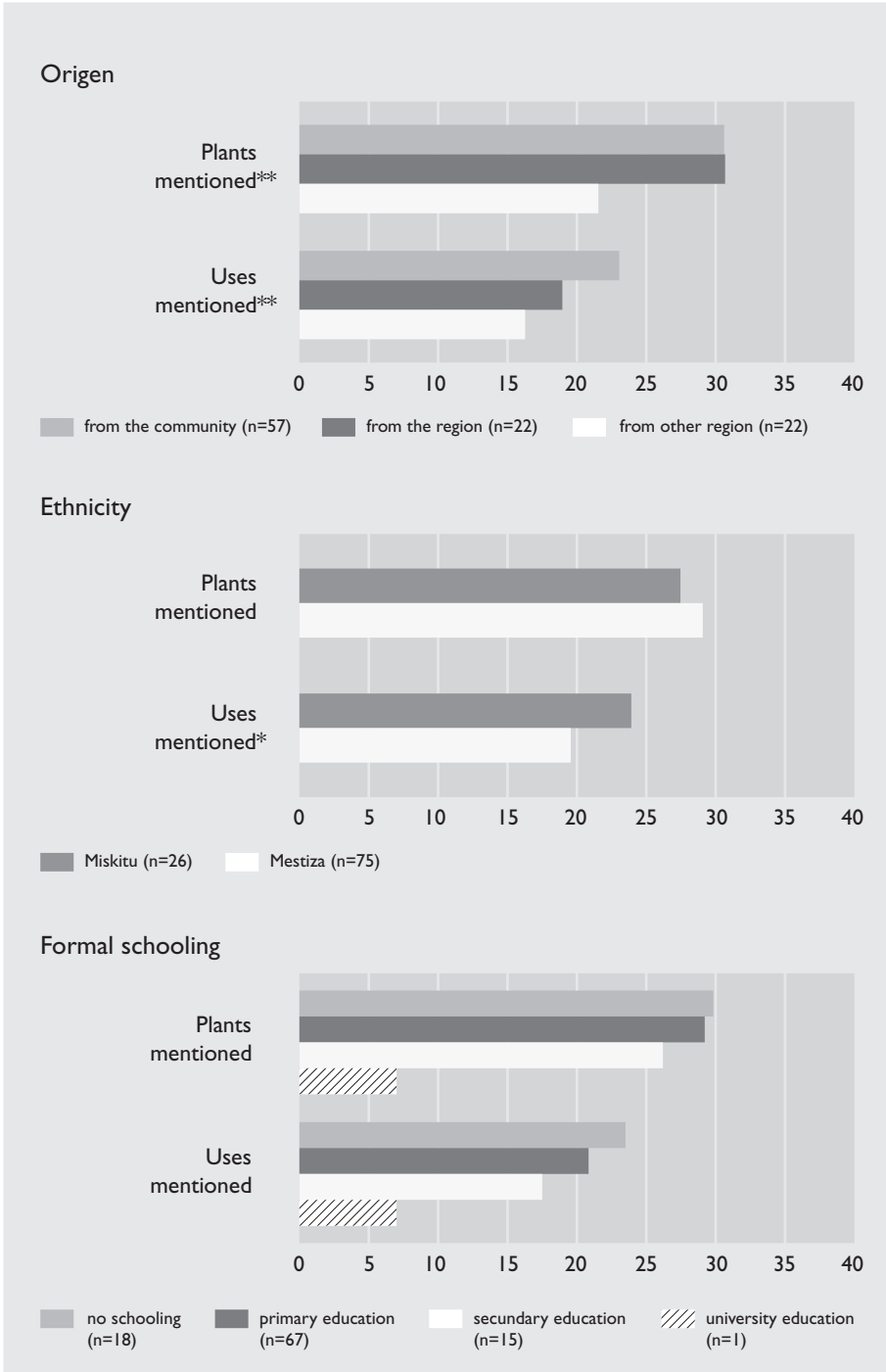
⁵⁰ Although the origin of most of the population in the communities selected in the RNB (MITK) is from within the same community, the opposite is true of the RBIM (El Castillo), given that the origin of practically the whole population is from other regions of the country.

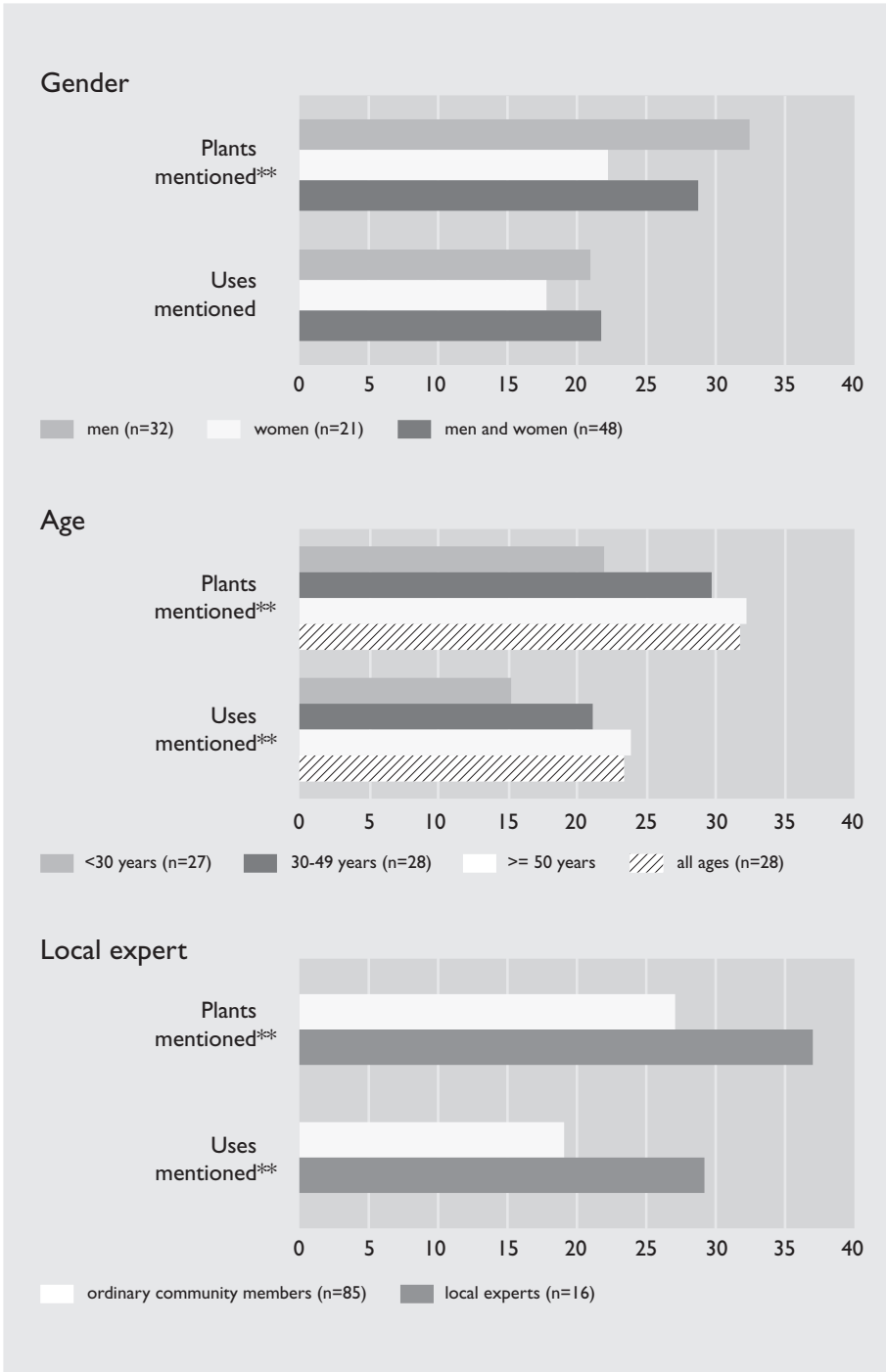
⁵¹ As these are zones that have better connections with urban centres, access to secondary education is higher in Miraflores-Moropotente and in Canta Gallo, reflected in the fact that in these two areas a greater part of the population has received a secondary education.

Figure 4 illustrates the average number of plants recognised and the average number of uses mentioned according to these characteristics. According to figure 4, there is a significant correlation between the number of plants recognised and the uses mentioned, on the one hand, and the protected area, the origin, age and being a local expert on the other, while there is significant correlation only between the number of plants recognised and gender, and between the number of plant uses and ethnicity. Apart from one group whose members had university education, no significant correlation was found between the number of plants recognised and the uses that were mentioned, on the one hand, and the level of formal education, on the other.

Firstly, the results confirm that knowledge of plants and their use, within a specific zone, is more limited among people who do not originate from that zone. Although there are people who do not originate from the region in all four protected areas studied, their concentration tends to be higher in agricultural frontier areas, in IBESo II represented by the communities of El Castillo in the buffer zone of the RBIM. This implies that in such areas, knowledge and local use of plants is not such an important factor in terms of contributing to generate local interest in the protection of floristic biodiversity.







Another result which is important to mention is that in all of the protected areas there are individuals, i.e. local experts, who owing to their formal or informal roles within the community as midwives, local doctors, forest guards, etc. have more knowledge about plants and their uses than the general population. Such individuals would be able to play an important role in efforts to strengthen local participation in the real protection of the areas concerned.

5. The participation of local actors in the management of the protected areas⁵²

At the Vth World Parks Congress of the International Union for the Conservation of Nature (IUCN) held in Durban in 2003, governance was highlighted as a central issue related to protected areas. The term ‘governance’ refers to the interactions among structures, processes and traditions that determine how power is exercised, how decisions are taken on issues of public concern, and how citizens or other stakeholders have their say. In its recommendations to governments and civil society, the IUCN Congress stated that “good governance contributes to the achievement of the objectives of protected areas and to social acceptance and sustainability of conservation in the long term.”⁵³ And with good reason, given that the establishment and management of protected areas involves fundamental issues such as property rights and the exercise of authority, and often serves as a vehicle for generating significant funding.

Focusing on the area of participation, or rather who participates and under which institutional arrangement, Haller and Galvin (2008) propose a continuum of participation in the management or governance of protected areas. As shown in figure 5, this continuum fluctuates between ‘agency control’ (governmental) with very little or no space for local participation in decision making, to what is termed ‘local control,’ indicating a situation in which the power to take decisions on the management of the protected area is directly exercised by those who live within or in the vicinity of the protected area, or by their democratically elected representatives.

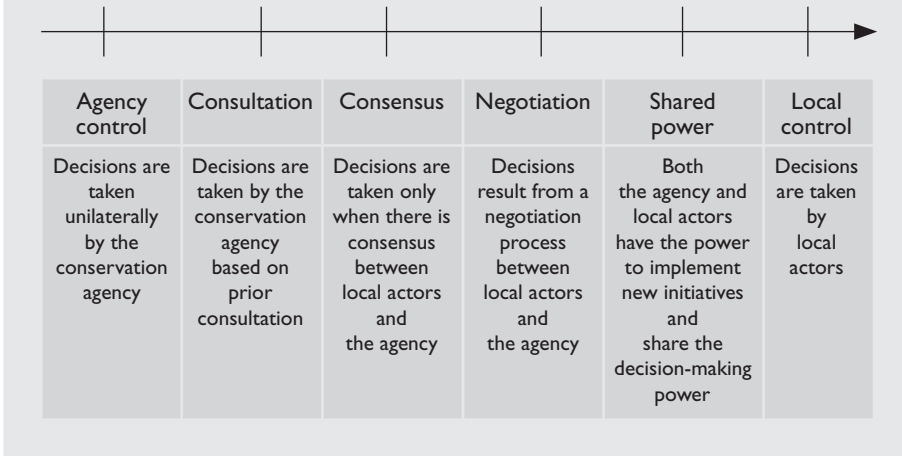
In many ways, the RBIM is very close to the commonly held image of protected areas as ‘fortresses of conservation’ (Haller and Galvin, 2008). A ‘biological reserve’ is the most restrictive management category according to Nicaragua’s protected area regulation.⁵⁴ Its administration can not be transferred according to any form of shared-management arrangement; human settlements can not be established within a biological reserve with the exception that indigenous rights must be respected; and access for the general public is limited and requires a special authorisation issued by MARENA. Along with its assigned management category, the demarcation of the

⁵² This section is based on the work coordinated by Eileen Mairena Cunningham and Francisco Paiz Salgado together with their colleagues (Mairena and Paiz, 2009).

⁵³ WPC Recommendation 16 *Good Governance of Protected Areas* (<http://www.earthlore.ca/clients/WPC/English/grfx/recommendations/PDFs/r16.pdf>, consulted on May 6, 2009).

⁵⁴ Decree 01-2007, approved on January 8, 2007. This regulation repeals decree 14-99.

Figure 5. Continuum of participation in the governance of protected areas



boundaries of the RBIM has contributed towards sustaining its image as a ‘conservation fortress’, given that the State not only set its boundaries via decree when the reserve was created in 1990, but also extended them by presidential decree in 1999.⁵⁵ This ‘adjustment’ meant that in some communities, people who had received land through the land reform undertaken as part of the peace agreement, suddenly found themselves living within the reserve. As a consequence of this ambiguous situation, conflicts have continued as regards the legality of the non-indigenous communities such as Samaria and Cristo Rey. According to the 2005 census, there was a recorded population of 747 people within the area of the RBIM that belongs to the municipality of El Castillo (INIDE, 2008). In 2004, the draft management plan for RBIM prepared by the NGO Friends of Río San Juan Foundation (FUNDAR) was presented. As part of the preparation, FUNDAR in coordination with MARENA had organised a wide-ranging consultation process in the area. This management plan, however, is currently blocked at National Assembly level due to a motion of unconstitutionality presented against MARENA by the territorial government of Rama and Kriol on February 21, 2007, for having prevented members of the Rama and Kriol indigenous and Afro-descendent communities from accessing, dwelling and freely undertaking subsistence activities within their traditional territory, due to a State decree taken

⁵⁵ Decree 66-99, approved on May 31, 1999 (<http://faolex.fao.org/docs/pdf/nic17191.pdf>, consulted on May 5, 2009).

without any consultation and no consideration for the Rama and Kriol within the Indio Maíz Biological Reserve.⁵⁶

The administration of the Río San Juan Biosphere Reserve is shared between the reserve's executive secretary and the Río San Juan territorial delegation, both based in San Carlos. MARENA receives support from the army and a group of forest guards, i.e. local people hired and trained by MARENA for patrolling the reserve. There are also a number of bodies intended to facilitate the coordination with other State institutions such as National Forestry Institute (INAFOR), district authorities, the authorities of RAAS⁵⁷ and national and international NGOs (Barrios and Broegaard, 2006; Ravnborg *et al.*, 2006).

The institutional setup for the RNB has been ambiguous for some time. Officially the reserve covers an area of 7,442 km², of which Stocks and his colleagues (2007) estimate that around 70 percent⁵⁸ corresponds to indigenous territories, divided into six indigenous areas, while the remaining 30 percent of the territory is populated by non-indigenous *mestizos*. As regards State institutions, the RNB territory is formally administered by MARENA through the Bosawas Technical Secretary and the departmental delegation of Jinotega and the territorial delegation of RAAN.⁵⁹ However, in practice and as regards MARENA, different institutional arrangements have been established for the different territories of the reserve. While MARENA has direct responsibility for administration of the non-indigenous territory, a number of institutional structures exist for the administration of the indigenous territories. Although it has not been formalised as such, in the Miskitu Indian Tasbaika Kum territory a type of co-management arrangement exists between MARENA and the NGO Centro Humboldt, which with funding provided by international aid agencies, including DANIDA, works with the leaders of indigenous communities for the patrolling and environmental administration of the territory. Viewed from the point of view of the indigenous authorities – on the basis of Law 445, and now supported by their collective land titles for their territories – the indigenous peoples now have the right to govern their ancestral homelands. This obviously modifies the right of

⁵⁶ Legal challenge filed on February 21, 2007 (http://calpi.nativeweb.org/Recurso_de_Amparo.htm; consulted on May 3, 2009).

⁵⁷ Región Autónoma de Atlántida Sur.

⁵⁸ The RNB covers an area of 7,442 km², of which Stocks *et al* estimate that 2,170.50 km² is non-indigenous territory and 4,900.04 corresponds to five of the six indigenous territories. As it is not within the boundaries of RNB, the territory of Li Lamni was not included in the study carried out by Stocks and his colleagues (Stocks *et al.*, 2007:1497).

⁵⁹ Región Autónoma de Atlántida Norte.

MARENA to administer these protected areas unilaterally. Having gained sovereignty over their territory, the indigenous peoples broadly reject formal arrangements of co-management,⁶⁰ whether with MARENA or with NGOs, although there is willingness towards more requested and specific forms of ‘collaboration’.

Although both the RNB and the RBIM were declared protected areas by the State through the use of an exclusive control regime, very different trajectories have been observed in the two areas in terms of the participation of local and State actors during the different phases from declaration to the creation of management plans and their implementation (figure 6). In the RNB, a process of organisation and mobilisation took place at grassroots level. As a response to the incursion of mestizo colonisers, the indigenous miskitu and mayangna communities, with the approval of MARENA and support from the Centro Humboldt and TNC, began in 1993 to demarcate their territories, prohibiting the sale of their lands to colonisers and placing forest guards to patrol their territories (Kaimowitz *et al.*, 2003; Hayes, 2008; Stocks *et al.*, 2007). Since 1999, these forest guards have been patrolling the protected areas with the approval of MARENA and the continued technical and financial support provided by TNC and the Centro Humboldt. Although not by design, at least not on the part of MARENA (Kaimowitz *et al.*, 2003), a strategic alliance developed between MARENA (and conservationist NGOs) on the one side, and the indigenous peoples on the other. Although the Nicaraguan State and MARENA reluctantly recognised the territorial demands and the associated loss of control that this recognition would imply for the government (Kaimowitz *et al.*, 2003; Stocks *et al.*, 2007), this alliance enabled MARENA to raise indigenous support to curb the advance of the agricultural frontier without having to directly get involved itself.⁶¹ In return, the indigenous peoples received the support of the State, backing their right to defend their territories from external interests related either to land, timber or mineral resources, and their territorial claims, from 2003 onwards also in accordance with Law 445.⁶² Consequently, the process to prepare a management plan for the RNB incorporated to a certain degree the zoning and

⁶⁰ In 2005, in a forum on the application of Law 445, the indigenous peoples declared their complete rejection of the concepts of ‘co-management’ and ‘joint ownership’ <http://www.jens-lone.dk/Rama%20Web/GTR-Pronouncements/Declaracion%20del%20Foro%20ley%20445%20dic%202005.rtf>; consulted on May 3, 2009.

⁶¹ Both Kaimowitz and his colleagues (2003) and Stocks and his colleagues (2007) state that during the first years following the declaration of the RNB, MARENA seemed to be unable to detain the advance of the agricultural frontier, partly due to its low level of presence in the zone, and in part because the colonisers, many of whom were former combatants, were armed.

⁶² Law 445 on Communal Property Regulations for the Indigenous Peoples and Ethnic Communities of the Autonomous Regions of the Atlantic Coast of Nicaragua and the Bocay, Coco, Indio and Maiz rivers, passed in December 2002 and signed by the president on January 22, 2003.

management norms by which the miskitu and mayangna indigenous communities govern their use of natural resources⁶³ (Jarquín, 2006).

Based on interviews undertaken with the inhabitants of the three communities, Yakalpanani, Boca de Plis and La Esperanza, located in the MITK, it appears that decision-making powers with respect to the use of natural resources, e.g. where to plant, how to fish or how many trees each family can exploit for their own needs, are decentralised according to the shared rules managed not only by the community leaders and forest guards, but also by a large part of the population. As a woman who acts as vice-coordinator of the community commented: *“We know that the forest is ours, that we can take all we need, but we have to be careful and not use it irresponsibly.”*⁶⁴ And as regards authorizations, a male producer from Yakalpanani explained: *“Up till now whenever we want to cut a tree we ask for authorisation from the territorial council and the forest guards. We receive the authorisation to cut the timber and explain what the wood will be used for.”*⁶⁵

As there is a kind of non-formalised co-management agreement – openly questioned by indigenous authorities – for the MITK between the Centro Humboldt and MARENA, the latter has practically no presence in the territory. On the contrary, through the presence of technicians and communications via community radio stations, Centro Humboldt maintains continuous contact with community authorities and forest guards. Consequently, as illustrated in figure 6, in terms of the continuum of participation in the management of protected areas, the situation for the RNB has evolved since its declaration from being a reserve created exclusively by the State, to the drafting of an agreed and negotiated management plan, and a present situation where the reserve’s administration oscillates between ‘shared power’ and ‘local control.’

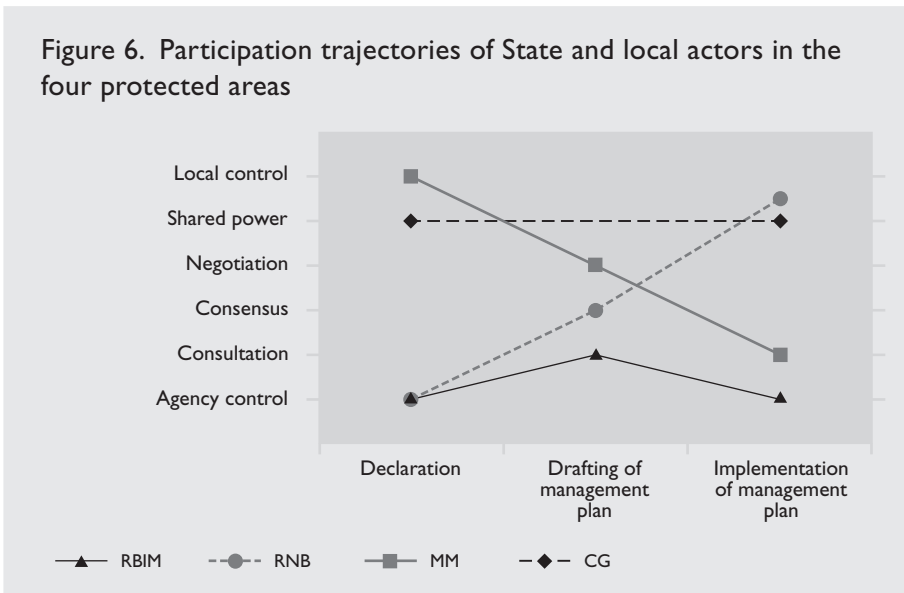
With the exception of the territorial demands of the Rama and Kriol communities located in the Indio Maíz Biological Reserve, questioning the authority of MARENA to unilaterally define management guidelines, there have been no local actors with an influence strong enough to change the institutional arrangement for the RBIM and its buffer zone in El Castillo. Although MARENA hired an NGO based in San Carlos to coordinate the drafting of a management plan and the subsequent consultations of

⁶³ Various zones of usage are differentiated for each community, i.e. the zone frequently used for planting – *‘el guatal’*; the zone of infrequent use (occasional hunting and wood extraction for domestic use); and the protected zone – *‘el Waula’*.

⁶⁴ Interview with Benita Moncada, La Esperanza, own translation.

⁶⁵ Interview with Marcelino Tenorio, Yakalpanani, own translation.

the plan, the institutional arrangement for the management of the RBIM continues to be centralised both as regards the reserve and its buffer zone.



Similarly, despite sharing a similar starting point, Miraflores-Moropotente and Canta Gallo have followed different trajectories in terms of local participation and the institutional configuration for the administration of the two protected areas. Both areas, although more extensively Miraflores (MARENA-PANIE, 2001; Ravnborg, 2002 and 2008), were declared protected areas in response to a local lobby for their protection. In Miraflores, following the declaration, a process began to draft a management plan. This process was coordinated by MARENA with the technical and financial assistance of various international organisations. Not all of this process included the broad participation of local inhabitants and their representatives, among other reasons because doubts arose regarding the legitimacy of the UCA Miraflores Cooperative, which had been instrumental in the lobby that led to the declaration. Nevertheless, in 2001, when the draft management plan was being published, broad participation was witnessed in the management of Miraflores-Moropotente as a protected area, reflected in the many meetings that were organised to discuss the draft management plan, and the involvement of more than 200 voluntary forest guards,⁶⁶ including both those

⁶⁶ In 2001, around 20% of the households in Miraflores-Moropotente indicated that one of their members was a voluntary forest guard (Ravnborg, 2008).

organised by UCA Miraflores and those who, from 1999 onwards, were organised by MARENA-PANIF. MARENA was perceived as the “technical secretariat” rather than as the “author” of the process or as the “owner” of the protected area. Some examples to illustrate this situation can be found in the fact that UCA-Miraflores withdrew from the process at a period prior to the publication of the management plan, and when MARENA requested it to reintegrate into the process and so provide it with legitimacy, UCA-Miraflores was in a position to set the conditions in terms of proposing conservation guidelines. Moreover, when the draft management plan was being presented to the public, a group of medium-sized producers stated that if they were not in agreement with MARENA’s management plan, they were not going to approve it. Although legally questionable, MARENA accepted this conditional approval (Ravnborg, 2008).

Based on the discussions held on the first draft of the management plan, a clear need was identified to modify the plan in order to obtain broader consensus between all the sectors of the population. To address this need, the Foro Miraflores (Forum Miraflores) was established to act as an association of local inhabitants and producers of Miraflores-Moropotente. The Foro Miraflores facilitated the conclusion of the management plan (MARENA, 2005). Following the formal creation as a protected area, and the approval of the management plan, the Foro Miraflores won the bid to co-manage Miraflores-Moropotente together with MARENA,⁶⁷ and it has attained the assistance of international organisations, which has allowed a technical team to be hired for the control and supervision of the area and funding for community development projects such as the construction of pre-school facilities and community houses, among others.

Foro Miraflores is composed by a Local Development Council with representatives from the 44 local community councils. This Local Development Council elects the seven members of its board. It has an executive director and a technical team responsible for the tasks of control and supervision.⁶⁸

The reception of Miraflores-Moropotente in co-management took place simultaneously with the passing of the Law on Environmental Crimes (*Ley de delitos ambientales*)⁶⁹

⁶⁷ Ministerial resolution 004A-2006 (personal communication, German Ramirez, Miraflores Forum, May 26, 2006).

⁶⁸ Please see the Foro Miraflores website at: www.foromiraflores.org.

⁶⁹ Law 559 on environmental crimes was passed on November 18, 2005; (<http://www.ccad.ws/documentos/legislacion/NC/ley559.pdf>, consulted on May 8, 2009).

and the law prohibiting the cutting, use and commercialisation of forestry products (Ley de veda forestal).⁷⁰ According to the leaders of Foro Miraflores, this meant a major blow, as it implied a significant change in management direction, from an initially proposed focus to support productive activities compatible with the conservation objectives, to an almost exclusive focus upon the enforcement, not only of the restrictions proposed in the management plan, but also those entailed in the new national laws. This has led to changes in the way the local population views Foro Miraflores. As a number of voluntary forest guards stated, they had viewed Foro Miraflores as a grassroots organisation formed within the community, which would assume the initiative to support the voluntary forest guards. However, according to many of the forest guards, this did not occur. Consequently, many forest guards have resigned, while others who carry on working as guards have opted to report abuses directly to MARENA, instead of to Foro Miraflores as they should. It is common to encounter people who draw the parallel between the present situation and that witnessed within UCA Miraflores, which during the 1990s gradually became less transparent in terms of decision making and financial management, and ended up losing its legitimacy.

In the case of Canta Gallo, management of the protected area has remained within the same institutional framework that also gave rise to the creation of the protection initiative. The responsibility for the administration is held by the district authority of the Condega District and regular follow-up is received from the district environmental commission, an open forum that on a monthly basis brings together community representatives, the mayor's office, State and local media organisations, and NGOs. Among other duties, the district environmental commission serves as a forum where community leaders present and deal with problems that arise related to natural resources, requesting the support of the district authorities and State institutions such as MARENA, the police, the National Forestry Institute (INAFOR) and the Agricultural and Forestry Ministry (MAGFOR), among others. The regularity and accessibility of its meetings, their public character and the presence of the local media, have turned the district environmental commission into a democratic forum that facilitates the participation of interested parties. Nevertheless, during interviews carried out as part of IBESo II, there was a perception that some local actors, such as the Nueva Esperanza coffee cooperative, have privileged access to the district authorities, thus their interests are taken more into account, for instance during the preparation of management plans for Canta Gallo.

⁷⁰ Law 585 prohibiting the cutting, use and commercialisation of forestry products, passed on June 20, 2006; (http://www.inafor.gob.ni:8080/legislacion_normas/PDF/Leyes/LEY_No_585_LEY_DE_VEDA_PARA_EL_CORTE__APROVECHAMIENTO.pdf, consulted on May 8, 2009).

As illustrated by the trajectories of the four protected areas since their declaration up to the implementation of management and/or daily administration plans (figure 6), governance, i.e. the participation of local and external actors and the institutional arrangements through which such participation is channelled, does not depend only on the way in which the protected area was declared or other strictly technical decisions for its management as a protected area. Rather, they depend on how the body that administers the protected area is integrated or used within a context of broader political processes, both as regards the authority to regulate access to natural resources, i.e. who has access and under which conditions, to who has access to administer the financial resources allocated for the sustainable management and the protection of natural resources.

6. Conclusions

6.1 Protected areas: what can be protected with the instruments available?

The legal status of protected areas and their regulation, including the protection categories that formally govern their implementation, aim not only to protect trees and areas of forest, but also ecosystems, biodiversity and cultural landscapes. This broader objective is also applicable in the declaration and regulation of the four protected areas included as cases in IBESo II. However, the interviews carried out with local inhabitants and the authorities of these areas – including forest guards, technicians, police and soldiers – indicate that the emphasis is almost exclusively placed on forestry aspects, such as control of the permits for domestic use and the transfer of timber. To a certain degree, this is due to the legacy of the image of fortress conservation, which corresponds to an almost militaristic image on what ‘control’ of a protected area means. In accordance with this image, a large part of the ‘daily’ instruments used for protection are of a military nature, such as ‘control posts’, ‘forest guards’, ‘patrols’ and ‘checkpoints’. This group of instruments provides for the control of permits, equipment such as chainsaws, and weapons, along with transfers of timber, and is useful in the context of forestry exploitation and hunting. However, such instruments are of little use in those aspects of ‘daily control’ related to biodiversity, the integrity of ecosystems and the quality of landscapes. Due to the lack of the applicable instruments, and to a certain level also due to being mired in an image of control as a ‘military’ activity rather than an activity involving monitoring, communication and results analysis, the efforts invested in non-forestry activities (with the exception of hunting) have been limited.

6.2 Protected areas – the sum of existing legislations and regulations – or something more?

As regards the environment in Nicaragua, the last few years have witnessed the adoption of a number of new laws, including the law prohibiting the cutting, use and commercialisation of forestry products (Ley de veda forestal), the law on environmental crimes (Ley de delitos ambientales)⁷¹ and the general water law.⁷² Together, these laws

⁷¹ The law on environmental crimes was repealed in 2007 by Law 641 of the new criminal code (<http://ni.vlex.com/vid/codigo-penal-36240998>, consulted on May 14, 2009).

⁷² Law 620, passed on May 15, 2007 ([http://legislacion.asamblea.gob.ni/Normaweb.nsf/\(\\$All\)/C0C1931F74480A55062573760075BD4B?OpenDocument](http://legislacion.asamblea.gob.ni/Normaweb.nsf/($All)/C0C1931F74480A55062573760075BD4B?OpenDocument); consulted on May 15, 2009).⁷³ Durante el taller de arranque de IBESo II, abril de 2007, Wiwili.

and their regulations deal with an important part of the issues that are often sought to be addressed through declaring an area protected. Therefore, the question is if the declaration of an area as a protected area, frequently with a surrounding buffer zone, actually adds to the existing protection or simply constitutes a double protection as suggested by Faurby (2007). At the formal level, the answer is 'yes, in some cases but not in all'. When the objectives of protection go beyond the protection of a forest and the quality of water, to include the protection of ecosystems, biodiversity and landscapes; which is to say, when the goal of protection is to protect qualities that depend on spatial or territorial interactions, the declaration of protection adds a form of protection that is not contemplated in the unification of 'sectoral' laws. At a real level – and related to the previous point – if instruments are not available that allow for a focus on those qualities that require protection, the declaration of a protected area is unable to protect much more than that already protected by existing laws and regulations.

6.3 Protected areas – a platform for generating projects – so as to achieve the application of existing laws and regulations?

As was clearly indicated by some of the inhabitants of Canta Gallo, the declaration of an area as a protected area can, among other aspects, represent a way of increasing the visibility of an area by giving it a territorial identity and an institutional appearance. This, in turn, increases the possibility of the area receiving resources, including human resources from the ministries and other public institutions, together with resources provided by international cooperation for protected areas not only for the protection as such, but also for broader development interventions, as can be clearly observed in the cases of Miraflores-Moropontense and El Castillo. In this manner, although there are exceptions, the declaration of a zone as a protected area, tends to increase the presence of the State, the probability that existing environmental laws will be applied (which are not necessarily related directly to protection) and the probability that development investments will be made. It is worth pointing out that besides the possible benefits for local inhabitants and ecosystems, the *raison d'être* of many public and private institutions (national and international NGOs) – at least in their present form – would also disappear without the institutional status of protected areas.

6.4 Zoning and management regulations – are these technical or political instruments?

To date, three of the four protected areas included in IBESo II – the RNB, the RBIM and its buffer zone, and Miraflores-Moropontense – now have a management

plan, although in the case of RBIM it still has not received final approval. The three management plans (TNC, 2003; FUNDAR, 2004; MARENA, 2005), have been created with funding from international cooperation agencies,⁷³ and represent solid works in terms of the characterisation of areas and proposals for zoning and administrative guidelines. However, based on the interviews carried out as part of IBESo II, only the management plan for RNB appears to be socially shared with the local population, given that for the indigenous territories, it is based on indigenous principles for the management of natural resources. However, there was practically no mention of management plans as an administrative instrument during the interviews with inhabitants and forest guards in El Castillo and in Miraflores-Moropotente.

As well as having been mainly created by technicians and academics from outside the zone, this can be explained to a large extent, at least in the case of Miraflores-Moropotente, by the focus on forestry aspects that was not deliberate but rather imposed, owing to the law on environmental crimes and the law prohibiting the cutting, use and commercialisation of forestry products. However, another possible explanation for the limited daily use of the management plans and their guidelines is that –without it being intended as such – these are highly political documents. Examples of this include when the draft management plan for the RBIM and its buffer zone proposes that the buffer zone “does not allow for a change in land use, except for the purpose of restoring or recuperating forest cover or for establishing perennial shaded crops” (FUNDAR, 2004:115), and when it proposes that a “maximum surface area of 15% of each farm is set aside for agriculture or livestock use”⁷⁴ (*ibid*). These proposals are clearly contrary to major political and economic interests, not only related to livestock keeping, but also to private firms such as PALCASA dedicated to the production of African palms. Without consistent legal and political support, it is highly unlikely that the institutions responsible for the administration of the protected areas, along with their environmental technicians and forest guards, are properly trained and willing to apply these management plans. In order to avoid dilemmas in which it may be more convenient to ‘forget’ the regulations stipulated for the management of a protected area, rather than clash with stronger interests and actors without the security of being able to depend on support from legal and political institutions, it is important to (i) recognise that what seem to

⁷³ TNC and USAID in the case of RNB; Critical Ecosystem Partnership Fund (http://www.cepf.net/grants/project_database/southern_mesoamerica/Pages/strategic_direction_4.aspx, consulted 15 May 2009) in the case of RBIM and its buffers zone; and Finnida and then the IADB in the case of Miraflores-Moropotente.

⁷⁴ This latter proposal is depending upon the approval of MAGFOR.

be technical documents and regulations have in fact strong political ramifications, and consequently (ii) there is a need to ensure not only the technical capacity for the administration of a protected area, but also the political and legal support and capacity for the application of management plans, including the technical guidelines for the management of the protected areas.

6.5 Local participation requires local authority and interest and external support

Local participation in general and the institutional set-up of co-management in particular, have created great expectations both in Nicaragua and internationally, owing to their potential to contribute towards real protection that is socially acceptable at local level.

Based on the interviews carried out in the four protected areas, it seems that local participation tends to be limited by the lack of communicational agility among local inhabitants, sometimes through voluntary forest guards or local leaders, and the corresponding authorities, whether these are MARENA, INAFOR, Foro Mirafior or the district authorities. Most requests for permits or denouncements or complaints can take from two weeks to a number of months, the latter being more commonly cited by local inhabitants. Obviously, these long periods are inconvenient whether there is a need to cut a tree, or when someone is faced by the uncomfortable situation of having accused or complained about a neighbour or unknown external actors, without knowing when the administrative process will conclude. Although many of the cases require the participation of external institutions such as MARENA and the Public Prosecutor's Office, other cases can be resolved locally. Even so, only in the indigenous territories of the RNB has the necessary authority been placed so that, for example, local leaders and forest guards can directly authorise the use of small quantities of timber. This helps speed up local management of natural resources and indicates more clearly in which aspects of protection the participation of external institutions is needed. It also contributes to freeing up capacities in external institutions. As stated by one of the local indigenous leaders of the MITK, "...as they're all armed, we can't control the illegal trafficking of timber. That's why it's important that the State collaborates with us and they've promised a military and police presence."⁷⁵ This would suggest that without the real transfer of authority at local level –obviously with responsibility

⁷⁵ During the launch workshop for IBESo II, April 2007, Wiwilí (own translation).

and in agreement with mutually-agreed rules – and without the support of State institutions at local level, it would be difficult to attain local participation in the management of protected areas.

6.6 Real protection depends on political processes rather than technical decisions

The comparison between the trajectories of the four protected areas since their declaration until the implementation of the management plans clearly shows that these trajectories depend on political processes, strategic alliances among actors, and the degree to which the environmental issue coincides with other economic, political and cultural interests of the actors involved. Apart from short-term economic gain, these interests include maintaining the basis that sustains their lives in the long term, defending their property rights, maintaining decision-making autonomy, and maintaining a way of life along with aesthetic, religious and cultural values.

Sometimes such strategic alliances in favour of conservation but not exclusively motivated by environmental concerns, lead to the conservation of biodiversity and ecosystems. This would appear to have been the case to date as regards the strategic alliance between the indigenous communities of RNB, NGOs such as the Centro Humboldt and the TNC, and MARENA. In other cases, although these alliances may exist, they are not strong enough to produce this result, as would seem to be the case of Miraflores-Moropotente, where it has not been possible to detain the conversion of land in the high-altitude part of the area into an area of intensive production with little biodiversity. Apart from not always leading to conservation, strategic alliances are dynamics: they do not only depend on the interests of actors, but also of opportunities and the restrictions faced by each actor in the present context.

Consequently, real protection of declared protected areas depends on an explicit focus on how to ‘manage’ actors and their mutual relations, i.e. how to regulate their activities, encouraging some and restricting others, rather than on specific institutional configurations and a focus on how to manage the protected area as a territory.

Annex 1. Location and characteristics of the parcels established for the characterisation of the floristic biodiversity

Parcels	1	2	3	4	5	6	7	8	9
Community	La Esperanza								
Zone	core								
Ecosystem type*	ENA								
Description of ecosystem	Secondary forest (10-29 years old)								
Predominant ethnicity	miskitu								
Distance from the community**	25 min								
	Secondary forest (less than 10 years old)								
	miskitu								
	15 min								
	miskitu y mestiza								
	45 min								
Parcels	10	11	12	13	14	15	16	17	18
Community	Laureano Mairena								
Zone	buffer								
Ecosystem type*	ENA								
Description of ecosystem	Secondary forest								
Predominant ethnicity	mestizo								
Distance from the community**	30 min								
	Secondary forest								
	mestizo								
	20-40 min								
	mestizo								
	20-30 min								
Parcels	Filas Verdes								
Community	Las Maravillas								
Zone	buffer								
Ecosystem type*	ENA								
Description of ecosystem	Secondary forest								
Predominant ethnicity	mestizo								
Distance from the community**	20-30 min								

Boswas Natural Reserve
– Miskito Indian Tasbaika Kum

Biological Reserve Indio Maiz
– El Castillo

Parcels	19	20	21	22	23	24	25	26	27
Community	La Laguneta		Sontule		El Coyolito				
Zone	buffer		buffer		buffer				
Ecosystem type*	ENC	ENA	EPH	ENC	ENA	ENA	EPH	ENA	ENC
Description of ecosystem	Secondary forest Coffee grown under forest cover		Pine forest Oak forest		Secondary forest Coffee grown under forest cover				
Predominant ethnicity	mestiza		mestiza		mestiza				
Distance from the community:**	25 min	15 min	5 min	20 min	25 min	25 min	20 min	15 min	15 min
Parcels	28	29	30	31	32	33	34	35	36
Community	San Jerónimo		Venecia		El Bramadero				
Zone	core		buffer		buffer				
Ecosystem type*	ENA	ENC	ENC	EPH	ENA	ENA	ENC	ENC	ENA
Description of ecosystem	Secondary forest Pine forest Coffee grown under forest		Conserved broad-leaved forest Pine forest		Pine forest Oak forest				
Predominant ethnicity	mestiza		mestiza		mestiza				
Distance from the community:**	15 min	15 min	5 min	5 min	20 min	5 min	20 min	25 min	5 min
Parcels	37	38	39						

* ENA – intervened natural ecosystem; ENC – un-intervened natural ecosystem; EPH – humanized productive ecosystem
 ** In walking distance (minutes)

References

- Barrios, M. and R. Broegaard. 2006. "La gestión ambiental llevada a cabo por las autoridades en El Castillo 1999-2005", *Cuaderno de Investigación 23*, Managua: NITLAPAN-UCA.
- Comisión del Medio Ambiente (CAM), Municipio de Condega. 2000a. *Propuesta del Área Protegida Parque Ecológico Municipal del Cerro de Santa Gallo*. Mimeo.
- Comisión del Medio Ambiente (CAM), Municipio de Condega. 2000b. *Estudio y características del área protegida Parque Ecológico Municipal Cerro de Santa Gallo*. Mimeo.
- Centeno, J.M. 2006. "Dicen no al cultivo de palma africana". *El Nuevo Diario*, 30 de agosto de 2006. (<http://impreso.elnuevodiario.com.ni/2006/08/30/departamentales/27706>)
- Faurby, O. 2007. "Políticas forestales y áreas protegidas como instrumentos para conservar los bosques de Nicaragua" en Ruiz, A. (Ed.): *Manejo de bosques, áreas protegidas y comunidades locales en Nicaragua: balance y nuevos retos a partir de los casos de Bosawás, Rio San Juan y Occidente*, Managua: Nitlapan.
- FUNDAR. 2004. "Plan de manejo de la Reserva Biológica Indio Maíz. Período 2005-2010." Borrador Parcial. Carried out by FUNDAR with the support of the Critical Ecosystem Partnership Fund (CEPF), Nicaragua.
- Haller, T. and M. Galvin. 2008. "Introduction: *The problem of participatory conservation*", in Galvin, Marc and Haller Tobias (Eds.): *People, Protected Areas and Global Change: Participatory Conservation in Latin America, Africa, Asia and Europe*, pp. 13-34, Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 3, Bern: Geographica Bernensia.
- Harvey, C.A., O.Komar, R. Chazdon, B.G. Ferguson, B. Finegan, D.M. Griffith, M. Martínez-Ramos, H. Morales, R. Nigh, L. Soto-Pinto, M. Van Breugel, and M.Wishnie. 2008 "Integrating Agricultural Landscapes with Biodiversity Conservation in the Mesoamerican Hotspot", *Conservation Biology*, Vol. 22, No. 1, pp. 8-15.
- Harvey, C.A. and J.C. Sáenz, 2008. Eds. *Evaluación y conservación de biodiversidad en paisajes fragmentados de Mesoamérica*. 1ª ed. Editorial INBio. Santo Domingo de Heredia, Costa Rica. 624 pp.
- Hayes, T.M. 2008. "The robustness of indigenous common-property systems to frontier expansion: Institutional interplay in the Mosquitia forest corridor. *Conservation and Society*, Vol.6, no.2, pp. 117-129.

- INIDE. 2008. "Municipios en Cifras". Instituto Nacional de Información de Desarrollo, Managua.
- IUCN and UNEP. 2006. World Database on Protected Areas. http://maps.geog.umd.edu/WDPA/WDPA_info/Spanish/WDPA2006.html, consultada el 28 de octubre de 2006.
- Jarquín, L. 2006. "El nuevo marco jurídico de la propiedad comunal en la Costa y los ríos Bocay, Coco, Indio y Maíz", in Rivas, Álvaro and Rikke Broegaard (Eds.): *Demarcacion Territorial de la Propiedad Comunal en la Costa Caribe de Nicaragua*, pp.63-80, CIDCA-UCA.
- Kaimowitz, D. 2003. "Resources, Abundance and Competition in the Bosawas Biosphere reserve, Nicaragua", in Halle, M., R. Matthew, J. Switzer (Eds.): *Conserving the Peace: Resources, Livelihoods and Security*, pp. 171-197, Winnipeg, Manitoba: International Institute for Sustainable Development Publication Centre.
- Kaimowitz, D.; A. Faune, and R. Mendoza. 2003. *Your biosphere is my backyard: the story of Bosawas in Nicaragua*. CIFOR, Bogor, Indonesia.
- Mairena Cunningham, E. and F. Paíz Salgado with the collaboration of S. Wheelock, M. Pereira, C. Kelly, E. C. Gómez, T. Ulloa, and R. Buitrago. 2009. "La participación de actores locales en el manejo de áreas protegidas y la gestión ambiental llevada a cabo por las autoridades" *Cuaderno de Investigación* 31 Managua: NITLAPAN-UCA.
- MARENA-PANIF. 2001. Plan de Manejo del Paisaje Terrestre Protegido de Miraflores-Moropotente (First draft). Dirección General de Áreas Protegidas, Ministerio de Ambiente y los Recursos Naturales (MARENA).
- MARENA (Ministry of Environment and Natural Resources). 2005. "Plan de Manejo del Paisaje Terrestre Protegido Miraflores-Moropotente". Managua. Ministerio de Ambiente y los Recursos Naturales, Nicaragua.
- Moreno, C.E. 2001. "Métodos para medir la biodiversidad". M&T-Manuales y Tesis SEA, vol.1.Zaragoza, España. 84 pp.
- Noguera Talavera, Á. and F. Reyes with the collaboration of H.M. Ravnborg, M.M. Salgado, and H. Balslev. In preparation. "Uso humano de la flora silvestre de diferentes partes de cuatro áreas protegidas y sus zonas de amortiguamiento en Nicaragua ." In Noguera Talavera, Á. (Ed.). In preparation. *Explorando la biodiversidad: Un estudio de ecosistemas desde la perspectiva de uso local en comunidades de cuatro áreas protegidas de Nicaragua.* FARENA – UNA.
- Perfecto, I; R. Rice; R. Greenberg and M.Van der Voort. 1996. "Shade coffee as refuge of biodiversity" in *BioScience* 16:174-182.
- Ravnborg, H.M. 2002. "Protected Areas: A Strategy to Protect Local Livelihoods in the Age of Globalization." Presented at "The Commons in an Age of Globali-

- sation,” the Ninth Conference of the International Association for the Study of Common Property, Victoria Falls, Zimbabwe, June 17-21, 2002.
- Ravnborg, H.M. with collaboration (2006): “Conservación de biodiversidad en el contexto de pobreza, avaricia e instituciones débiles” *Cuaderno de Investigación* 25, Managua: NITLAPAN-UCA.
- Ravnborg, H.M. 2008. “Organising to protect: Protecting landscapes and livelihoods in the Nicaraguan hillsides”. *Conservation and Society*, 6(4): 283-292.
- Rosthchuh, T. 2006. “También intentaron desviar curso de río. Crece gravedad de cargos contra empresa de palma africana”. *El Nuevo Diario*, 24 de noviembre de 2006. (<http://impreso.elnuevodiario.com.ni/2006/11/24/nacionales/34721>)
- Rosthchuh, T. 2007. “Inafor desapueba extensión de siembra de palma africana.” *El Nuevo Diario*, 14 de junio de 2007. (<http://impreso.elnuevodiario.com.ni/2007/06/14/departamentales/51234>).
- Stocks, A., B. McMahan and P. Taber (2007): “Indigenous, Colonist, and Government Impacts on Nicaragua’s Bosawas Reserve”, *Conservation Biology*, Vol. 21, No. 6, pp. 1495-1505.
- TNC (2003): Plan de Conservación de la Reserva Natural BOSAWAS, Nicaragua: The Nature Conservancy.
- Vandemeer, J. and I. Perfecto (2007): “The Agricultural Matriz and a Future Paradigm for Conservation”, *Conservation Biology*, Vol. 21, No. 1, pp. 274-277.
- World Resources Institute (WRI). 2003. Earth Trends – Environmental Information. http://earthtrends.wri.org/pdf_library/country_profiles/bio_cou_558.pdf, consulted on October 25, 2006.
- Zeledon, E.B. and N. Maggi Kelly (2008): “Understanding large-scale deforestation in southern Jinotega, Nicaragua from 1978 to 1999 through the examination of changes in land use and land cover”, *Journal of Environmental Management*, doi:10.1016/j.jenvman.2008.03.016.